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Safety of interventional bronchoscopy in elderly patients

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Abstract

Aim: Interventional bronchoscopy (IB) is a frequently used method in the diagnosis and /or treatment of malignant or benign airway stenosis. The gradual increase in the elderly population appears as difficulties in the diagnosis and treatment process. In this regard, in this cohort over 65 years old who underwent endobronchial treatment, comorbidities, complications, procedural mortality were evaluated.

Material and Methods: The study has a retrospective and observational design. Patients who underwent rigid bronchoscopy in the interventional pulmonology unit between March 2019 and March 2021 were included in the study. Differences were evaluated in terms of comorbidity and complications in the groups <65, 65-74 and ≥75 years of age.

Results: In the study, 317 IBs were performed in 268 patients. Among the age groups, the rates of hypertension, diabetes mellitus, coronary artery disease, and chronic renal failure were found to be significantly higher in the ≥75 age group ($p<0.05$). It was observed that complications did not differ between age groups ($p>0.05$).

Discussion: Although there is an increase in comorbidity rates in elderly patients, according to this study, there is no age-related contraindication for the procedure. Endobronchial treatment decision should not be made primarily according to age.

Keywords

Endobronchial Treatment, Rigid Bronchoscopy, Geriatric; Mortality, Complication

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Introduction

The elderly population is increasing day by day all over the world. This situation occurs with an increasing disease burden. In elderly patients, fragility, the presence of comorbidities, the use of multiple drugs, and the need for social support appear as factors that complicate the diagnosis and treatment process [1,2]. Interventional bronchoscopy (IB) is a commonly used method for the diagnosis and/or treatment of malignant or benign airway stenosis. Lung cancer can present with malignant airway obstruction (MAO) in 10% of cases at admission [3]. Since the incidence of lung cancer increases with age, the rate of elderly (> 70) patients requiring interventional procedures is gradually increasing [4]. IB is an effective and safe method in malignant airway obstruction. It can be used as bridging therapy before systemic therapy and for safe diagnosis in critically ill patients [5,6].

IB improves the quality of life and respiratory functions, and can provide weaning. Benign airway stenosis includes post-intubation, post-tracheostomy, infection-related stenosis, and transplant airway disease. Hemoptysis, foreign body aspiration, stent placement are rigid bronchoscopy (RB) indications [7]. RB is the gold standard method for airway obstruction. Ventilation, airway management, suction, direct intervention to bleeding, tumor removal and wide diameter enabling stent placement are the greatest advantages of this procedure [8]. It is applied with an acceptable rate of complications and mortality after appropriate patient selection [9].

General anesthesia (GA) with total intravenous anesthesia (TIVA) or sedation during RB is another cause of difficulty in selecting elderly patients [10]. The American Society of Anesthesiology (ASA) scores are generally high in elderly patients who undergo this procedure [11]. According to various reasons, the need for endobronchial diagnosis or treatment with RB is increasing in elderly patients [12]. In this study, we aimed to contribute to treatment planning with RB in elder population. For this reason, we present in this context, we investigated the comorbidities, complications and procedural mortality in patients over 65 years of age who underwent endobronchial treatment with RB.

Material and Methods

Patients who underwent endobronchial diagnosis and treatment with IB between March 2019 and March 2021 were included in our study. After obtaining approval from the local ethics committee of our hospital, the data were collected retrospectively (Local Ethics Committee No: 710/ 21.01.2021). All patients were treated in the interventional pulmonology unit by the same team of three interventional pulmonologists.

Patients' age, gender, accompanying comorbidities, pre-procedure diagnoses and indications, pre- and post-procedure pathological diagnoses were recorded. Patients were divided into groups as <65 years, 65-74 years, and ≥75 years. The difference between the three groups was evaluated for these parameters.

The drugs used for various indications before the procedure and causing bleeding tendency were grouped as acetylsalicylic acid, anti-platelet agents -clopidogrel- and anticoagulants -low molecular weight heparin (LMWH), warfarin, non-vitamin K antagonist oral anticoagulants (NOACs).

Preliminary diagnoses before the procedure were grouped as malignant pathologies and benign pathologies. In endobronchial treatments, first of all, lesion localization was recorded. Patients with a pre-procedural diagnosis were grouped as lung cancer, extra-thoracic malignancy, post-intubation tracheal stenosis (PITS), post-tracheostomy tracheal stenosis (PTTS), and benign tumor. Patients with no known diagnosis before the procedure were grouped as "none".

Mortality in the first week after the procedure was evaluated as procedural mortality.

Interventional procedures

All procedures were performed under GA with TIVA. The ASA [13] classification performed in the pre-procedure evaluation was recorded. ASA scores are grouped as non-life-threatening (ASA-1,2,3) and life-threatening (ASA-4,5). Electrocardiogram, invasive arterial blood pressure, oxygen saturation, and arterial blood gas monitoring were routinely performed in each patient throughout the procedure. Jet ventilation was performed with a system integrated into the rigid bronchoscope.

The patients were intubated with RB in the operating room (Efer-Dumon, 11 mm-diameter, 43 cm length, Efer Endoscopy, Marseille, France). Treatment procedures were argon plasma coagulation (APC) (ERBE ICC 200/APC 300 electrosurgical unit, rigid APC probe, 50 cm length, 2.3 mm diameter), mechanical tumor resection (MTR), cryoextraction, cryotherapy (ERBOKRYO® CA unit, rigid cryoprobe 3 mm diameter, 53 cm length; ERBE, Medizintechnik, GmbH, Tübingen, German), dilatation, stent placement, stent revision and combinations of these procedures. Procedure indications were classified as PITS, PTTS, malignant airway stenosis, tracheoesophageal fistula, foreign body, hemoptysis, and benign airway stenosis.

Complications were grouped as bleeding, respiratory failure, unstable hemodynamics and arrhythmia. Bleeding was graded as "Grade 0- No bleeding or minimal bleeding that stopped on its own; Grade1- Mild bleeding that could be stopped with cold 0.9% NaCl solution or epinephrine solution (1 mg / 100 ml saline water); Grade 2- Moderate bleeding that required argon plasma coagulation or bronchial balloon blockage; Grade 3- Severe bleeding that resulted in transfusion of blood products, vasopressor support, rescue operation or death" [14].

Age groups of <65, 65-74 and ≥75 years were compared in terms of complications and procedural mortality.

Statistical analysis

SPSS 16.0 for Windows package program was used for the statistical analysis. Normality analyzes of the continuous data were performed using the Shapiro-Wilk Test. Firstly, descriptive statistics were expressed. Normally distributed data were expressed as mean ± standard deviation, and non-normally distributed data were expressed as median and interquartile range. Pearson's Chi-Square and Fisher's Exact tests were used for comparisons of categorical data; categorical data were expressed as the counts and percentages. The $p < 0.05$ level was used for the statistical significance.

Results

Two hundred sixty-eight patients (M / F: 222/46) who underwent IB were included in the study. Recurrent endobronchial therapy was performed in 33 patients. Seventeen of 33 patients had

lung cancer, 3 patients had extra-thoracic malignancy, 3 patients had airway obstruction due to benign tumors, and 10 patients had PITS / PTTS. A total of 268 patients underwent interventional procedures with 317 RB at different visits.

The mean age was 61 ± 12 years; 152 patients (56.7%) were <65 years old, 116 were ≥65 years old. Comorbidity distributions in patients are given in Table 1. Thirty-one patients classified as other comorbidities had atrial fibrillation, papillomatosis, valvular heart disease, hypothyroidism, hyperlipidemia, rheumatoid arthritis, bronchiectasis, and psychosis. When the comorbidities were evaluated, statistically significant differences were found between the age groups in terms of hypertension (HT), diabetes mellitus (DM), coronary artery disease (CAD), chronic renal failure (CKD) and lung cancer (LC) (p <0.05). The lung cancer rate was significantly higher in the <65 years of age group, the others were higher in the ≥75 years of age group (p <0.05; Table-1).

Although the ASA score was higher in patients over the age of 65 years, this difference was not statistically significant (p = 0.052).

Indications for procedures, pre-diagnoses and post-procedural pathological diagnoses according to age groups are shown in Table 2. There was no difference between <65 and ≥65 years of

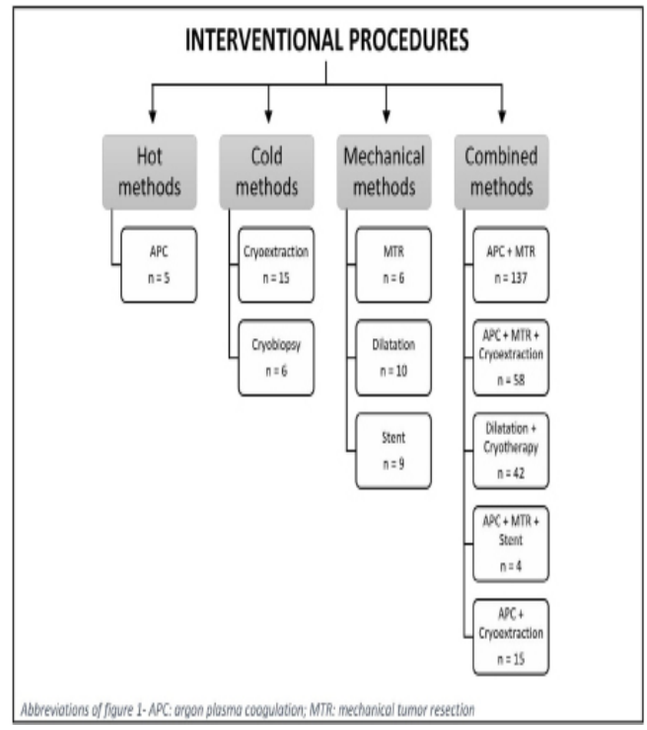

Figure 1. Interventional procedure methods

Table 1. Comorbidities, drugs and complications

		Age groups			p-value
		< 65	65-74	≥ 75	
		N (Column- %)	N (Column- %)	N (Column- %)	
Gender	Female	33 (18.4)	15 (15.5)	6 (15.8)	0.798
	Male	146 (81.6)	82 (84.5)	32 (84.2)	
HT		40 (22.2)	36 (36.7)	20 (51.3)	<0.001
DM		28 (15.6)	15 (15.3)	13 (33.3)	0.023
CAD		21 (11.7)	24 (24.5)	12 (30.8)	0.002
COPD		12 (6.7)	9 (9.2)	2 (5.1)	0.639
CKF		0 (0)	4 (4.1)	2 (5.1)	0.017*
Lung cancer		54 (30)	19 (19.4)	5 (12.8)	0.028
Extrathoracic malignancy		13 (7.2)	3 (3.1)	3 (7.7)	0.337
Venous thromboembolic event		5 (2.8)	6 (6.1)	1 (2.6)	0.345*
ASA score	Not life threatening 1-2-3	146 (81.1)	68 (69.4)	27 (69.2)	0.052
	Life threatening 4-5	34 (18.9)	30 (30.6)	12 (30.8)	
Acetylsalicylic acid		14 (7,8)	19 (19,4)	9 (23,1)	0,004
Clopidogrel		8 (4,4)	6 (6,1)	3 (7,7)	0,661
DMAH		5 (2,8)	11 (11,2)	1 (2,6)	0,008
Warfarin		3 (1,7)	1 (1)	5 (12,8)	<0,00*
NOAC		3 (1,7)	2 (2)	2 (5,1)	0,407*
Anticoagulant (all 3 types)		11 (6,1)	14 (14,3)	8 (20,5)	0,009
Bleeding	None	147 (81,7)	84 (85,7)	30 (76,9)	0,447
	Yes	33 (18,3)	14 (14,3)	9 (23,1)	
Bleeding grades	Grade 0	147 (81,7)	84 (85,7)	30 (76,9)	0,794*
	Grade 1	12 (6,7)	7 (7,1)	3 (7,7)	
	Grade 2	20 (11,1)	7 (7,1)	6 (15,4)	
	Grade 3	1 (0,6)	0 (0)	0 (0)	
Complication	None	144 (80)	84 (85,7)	29 (74,4)	0,614*
	Bleeding	33 (18,3)	14 (14,3)	9 (23,1)	
	Respiratory failure	1 (0,6)	0 (0)	0 (0)	
	Unstable hemodynamic state	1 (0,6)	0 (0)	0 (0)	
	Arrhythmia	1 (0,6)	0 (0)	1 (2,6)	

Pearson Chi-square * Insufficient sample counts

Table 2. Indications, pathological diagnosis

		Age groups		
		< 65	≥ 65	p-value
		N (Column- %)	N (Column- %)	
Pre-diagnosis (malignant or not)	Benign	46 (25.6)	30 (21.9)	0.450
	Malignant	134 (74.4)	107 (78.1)	
Diagnosis before procedure	None	76 (42.2)	76 (55.5)	0.111
	Lung cancer	62 (34.4)	32 (23.4)	
	Extrathoracic malignancy	12 (6.7)	11 (8.0)	
	PITS / PTTS	24 (13.3)	16 (11.7)	
	Benign tumor	6 (3.3)	2 (1.5)	
Indication	PITS / PTTS	28 (15.6)	15 (10.9)	0.812*
	Malignant airway stenosis	133 (73.9)	105 (76.6)	
	TOF	4 (2.2)	5 (3.6)	
	Foreign body	1 (0.6)	1 (0.7)	
	Hemoptysis	4 (2.2)	2 (1.5)	
	Benign airway stenosis	10 (5.6)	9 (6.6)	
Pathological diagnosis	None	20 (11.1)	11 (8.0)	-
	Squamous	67 (37.2)	64 (46.7)	
	Adeno	13 (7.2)	9 (6.6)	
	Small	6 (3.3)	11 (8.0)	
	Carcinoid	11 (6.1)	2 (1.5)	
	Adenoid cystic carcinoma	5 (2.8)	1 (0.7)	
	Malignant epithelial tumor	3 (1.7)	3 (2.2)	
	Extrathoracic malignancy	5 (2.8)	4 (2.9)	
	Hamartoma	6 (3.3)	5 (3.6)	
	Granulation tissue	16 (8.9)	12 (8.8)	
	Papilloma	4 (2.2)	0 (0.0)	
	NOS	15 (8.3)	10 (7.3)	
	Foreign body	1 (0.6)	4 (2.9)	
	Others	8 (4.4)	1 (0.7)	

Pearson Chi-square test * Insufficient sample counts

age groups in terms of pre-diagnoses and indications (p> 0.05). Procedure localizations were as follows: 102 tracheae, 8 main carina involvement, 83 right main bronchi, 33 right intermediary bronchi, 79 left main bronchi and 12 left lower lobes. The endobronchial procedures applied are given in Figure-1.

The use of drugs that may cause bleeding in age groups was examined, and it was observed that there was a significant increase in the use of acetylsalicylic acid, LMWH, and warfarin in advanced age (p <0.05; Table-1). Before the procedure, the use of these drugs was discontinued at the appropriate time and the procedures were applied. However, in 7 cases, due to the high risk of ischemia, procedures were performed without discontinuation of these drugs. Grade 2 bleeding was observed in only one patient among these procedures.

No complications occurred in 257 (81.1%) of all procedures (Table 1). It was observed that there was no difference between the age groups in bleeding, respiratory failure, hemodynamic instability, and severity of bleeding (p> 0.05). Mortality due to Grade 3 bleeding during the procedure occurred in 1 patient. No procedural mortality was observed except for this patient.

Discussion

In daily practice, we encounter elderly patients more frequently and we apply more invasive procedures as life expectancy increases. Nowadays, in interventional pulmonology, endobronchial procedures are being used more frequently, and awareness of this issue is increasing, especially in lung cancer treatment approaches. Central airway stenosis is seen in 20-30% of the follow-up of primary or metastatic lung cancers [15]. As far as we can see in the literature, there are very few studies evaluating the approach, comorbidity, procedure risk, safety and mortality in elderly patients in rigid bronchoscopy. Therefore, we wanted to discuss elderly patients from this perspective according to our two-year experience. In the study of Özgül et al, it was seen that 47.2% of 2029 interventional procedures were performed due to malignant airway stenosis in 10-year experience [16]. In our study, this rate was 76%. There was no significant difference between patients < 65 and ≥ 65 years of age.

In Davoudi et al's study evaluating 18 patients over the age of 80, the most common comorbidities were hypertension, arrhythmia, and coronary artery disease, and they reported that there were controllable complications (hypotension, arrhythmia, hypoxia, and bleeding) in procedures and there was no need for intubation [17]. In another study evaluating fiberoptic bronchoscopy, two groups were compared retrospectively, and mortality and side effects were found more frequently in octogenarians (> 80 years of age); additionally, it was reported that comorbidities were more common in these patients, but no relationship was established [18].

Ernst et al reported in their study on 554 patients, in which all age groups were evaluated, that the complication rate due to the interventional procedure was 19.8% [19]. In another study, Valipour et al found that the life-threatening hemoptysis rate was 5-15% [20].

In our study, it was found that HT, DM, CAD, and CRF were significantly more common in advanced age. The complication rate was 18%. Although there was an increase in comorbidities with advanced age, there was no difference in terms of complications according to age groups. The use of acetylsalicylic acid and anticoagulants was found to be higher in the patient group aged 75 years and over, but there was no difference in terms of bleeding. In addition, patients with respiratory failure, hemodynamic instability and uncontrolled bleeding were all <65 years of age, contrary to expectations. The nature, localization, vascular neighborhood or invasion of the lesions are other important risk factors for bleeding complication independent of age.

In studies on safety and efficacy of fiberoptic bronchoscopy, no difference was found between the age groups in terms of complications, and it was found to be safe in the elderly [21,22]. However, sedation was used in the procedures in these studies. Complications in rigid bronchoscopy can be thought to be related to the total intravenous GA. According to Pathak et al's study on cardiovascular complications, hypercarbia and hypoxia can be associated with general anesthesia [10]. Grendelmeier et al evaluated the use of propofol in flexible bronchoscopy and rigid bronchoscopy and found that there was no significant difference in complications, but there was more hypotension and carbon dioxide retention in elderly patients [23]. In our study, the ASA score was higher in the elderly group, but there was no difference in complications. In Murgu et al study, ASA 3 and 4 were detected in 90% of the patients, and it was found to be unrelated to mortality [11]. There was no significant increase in mortality rates with age in our study.

According to the McLaughlin et al's study, in which 73 patients over the age of 85 were evaluated for fiberoptic bronchoscopy, the difference in comorbidity load should be considered when deciding whether to perform invasive procedures, but age alone should not be considered a contraindication [21].

Retrospective and single-center design were the main limitations of this study. In addition, the quality of life was not evaluated after the procedure. Studies evaluating the performance status before and after the procedure can guide the management of elderly patients.

Conclusion

Elderly patient admissions are increasing day by day; this leads to an increased need for endobronchial treatment. In these patients, the burden of comorbidity is higher than the younger patient group. Poor ASA score and comorbidities are important in deciding whether to perform the procedure, but there is no scientific evidence to show that these factors are contraindications. In this study, comorbidities were found more frequently in elderly patients, but there was no difference in procedural complications and mortality. The decision to perform the procedure should be made with the patient according to the indication, considering the risks and benefits.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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